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5. **Parnassia Kotzebuei** Cham. & Schlecht. Linnaea, 1: 549. 1826.

Labrador, Bering Strait, Rocky Mountains.

6. **Parnassia parviflora** DC. Prodr. 1: 320. 1824.

Canada, Utah.

7. **Parnassia palustris** L. Sp. Pl. 273. 1753.

Labrador, Minnesota, Canada, Northwest Territory, Lake Superior.

8. **Parnassia Californica** (A. Gray) Greene, Pittonia, 2: 102. 1890.

Parnassia palustris var. *Californica* A. Gray, Bot. Calif. 1: 202. 1876.

Revision of the North American Thuidiums.

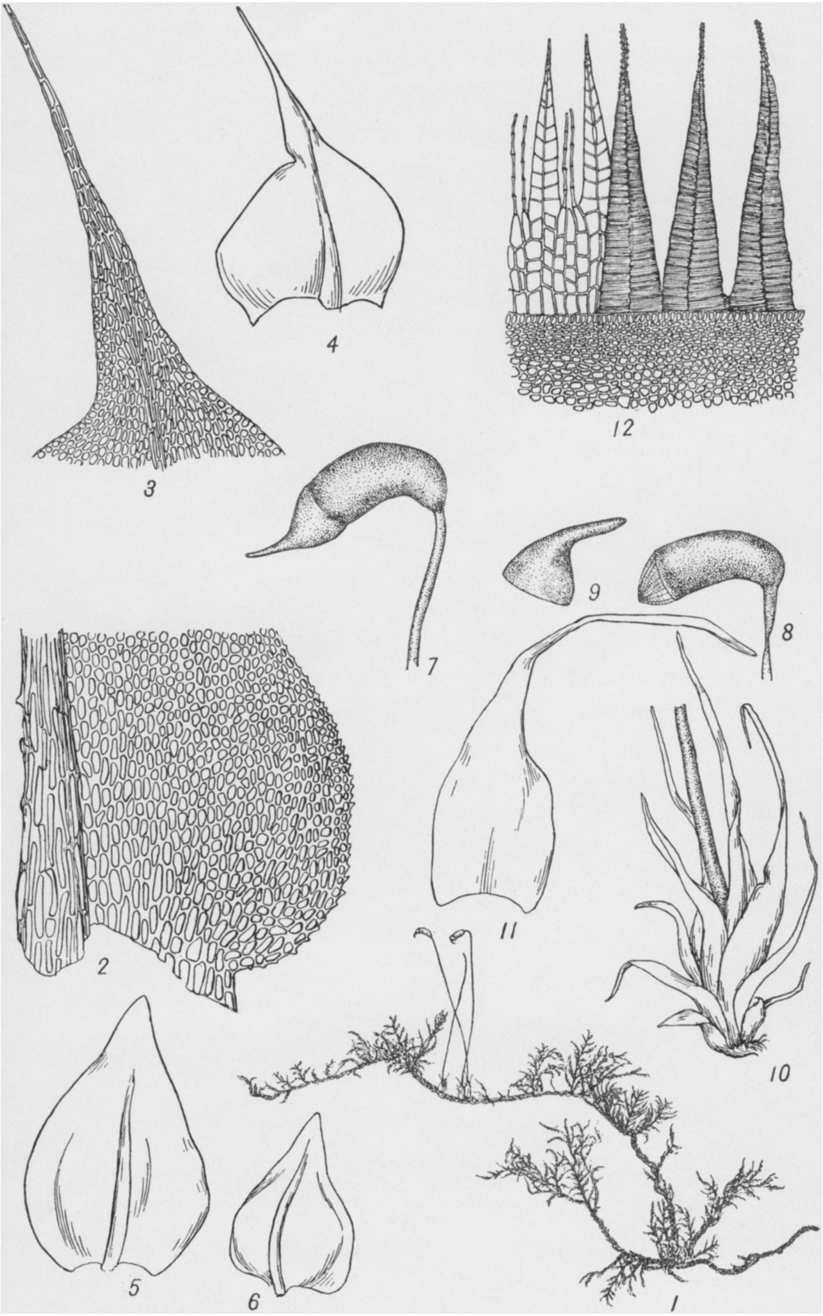
By G. N. Best.

The larger part of the material on which this revision is based was furnished by the collection of *Thuidiums* in the herbarium of Columbia University, consisting of a large number of both American and European specimens and exsiccatae. These have been especially useful in that they made a comparison possible between native and foreign species by which diagnostic characters could be deduced with more certainty than could otherwise have been done.

My thanks are due Mrs. Britton for verifying all the citations, arranging the synonymy and in securing the loan of type specimens; also M. Eugene Autran, Prof. John Macoun and Dr. B. L. Robinson for the loan of type specimens. For valuable contributions I am indebted to Dr. C. R. Barnes, Dr. Henri Philibert, Dr. T. C. Porter, Mr. E. A. Rau, Dr. J. K. Small and Rev. A. C. Waghorne.

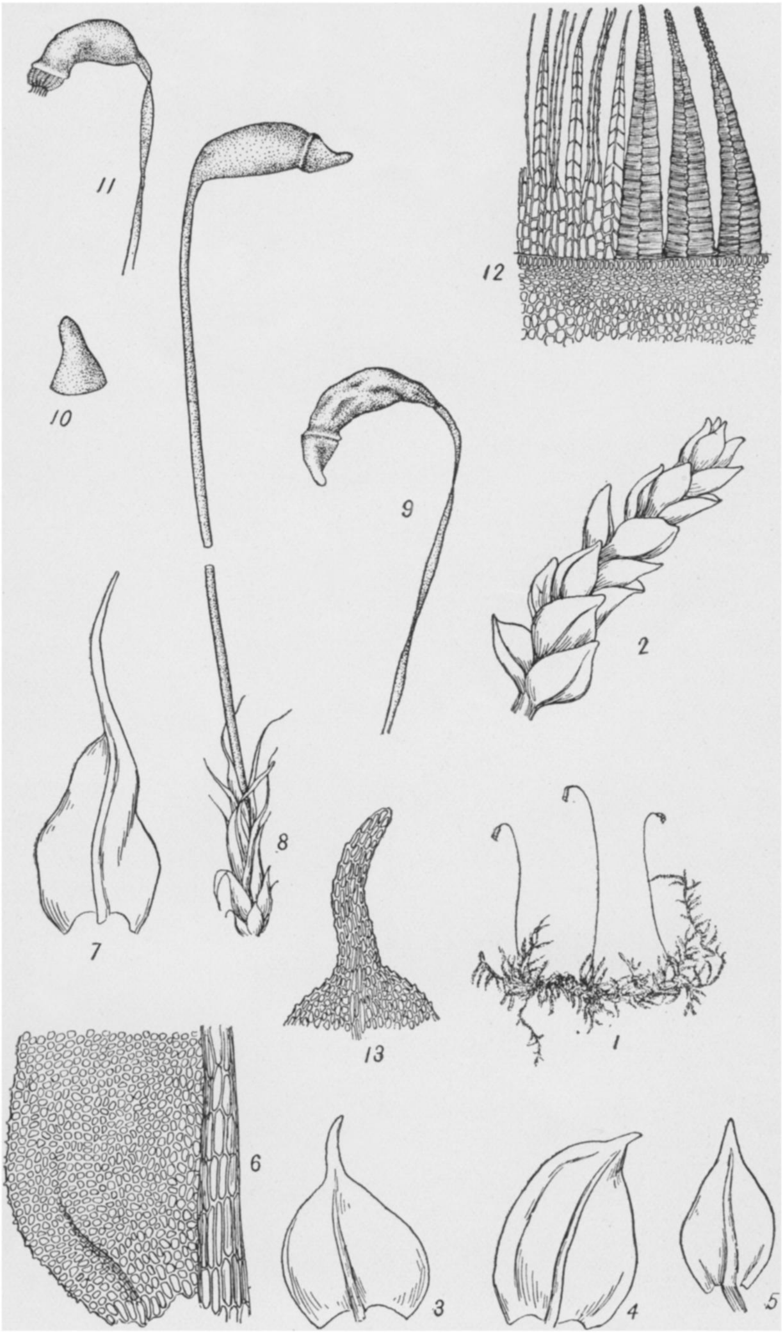
The *Thuidiums* are widely dispersed over both continents. In North America they range from Greenland to Florida and from the Labrador to Vancouver's Island. Most common in the United States east of the Rocky Mountains, they are rare or absent on the Pacific slope.

In studying a specific type of wide distribution it should be



E.L.HYATT Del.

THUIDIUM PHILIBERTI LIMPR.



E.L.HYATT Del.

THUIDIUM VIRGINIANUM (BRID.) LINDB.

borne in mind that it has its centers of maximum as well as minimum development. In other words, it has its evolute and involute forms. In some instances these differ considerably, so much so that without the connecting forms they appear as distinct species. In fact they are not infrequently so treated, especially by those systematists who see a " new species " in the most trifling variation and who do not care to dispel the illusion by the necessary investigation.

In this revision I have endeavored to establish the commonly recognized species rather than to make new ones. Without ascertaining the precise limits of the former, it would be impossible to be sure of the latter. And as many of the *Thuidiums* are sterile in certain localities, diagnostic characters have been drawn largely from the vegetative system. The number and position of the papillae of the leaf cells, more than their size, have been found quite constant and therefore of value in discriminating closely related species. The paraphyllia, important from a generic standpoint, are less so from a specific, because of their variability. The cilia and perichetial bracts in these, as in nearly all mosses, are the parts most likely to be modified by changed conditions of growth.

Types have been seen when possible; when not, as was too frequently the case, authentic specimens. These have been studied with so much care as to almost preclude the possibility of mistake. Those species admitted into the Manual as peculiar to North America have likewise been closely investigated with the following results: *Thuidium erectum* Duby is *Th. delicatulum*, as is proved by the type and the author's own correction ; *Hypnum calyptratum* Sulliv. is *Th. microphyllum*, with abnormal capsules, due to parasites ; *Thuidium Alleni* Aust. is a dubious sterile form most probably of *Th. delicatulum ; Hypnum remotifolium* Grev. is not a *Thuidium*, neither is it North American. *Thuidium lignicola* Kindb., admitted in Macoun's Catalogue of Canadian Musci, represents the northern variation of *Th. microphylium* from which it seems impossible to separate it on good grounds. *Hypnum tamariscinum* Hedw., although quite common in Europe, appears to go by default in North America. The tripinnate ramification and the unipapillate apical cell of the branch-leaves serve to distinguish it from *Th. delicatulum.*

NOTE.—When unipapillate, bipapillate and pluripapillate are used in connection with leaf cells they mean respectively one, two, three or more papillae on each surface, unless otherwise stated; when leaf cells are referred to they invariably mean those of the stem leaves. ! indicates that the type has been seen by the author.

Thuidium Br. and Sch. Br. Eu. fasc. 49–51. 1852

Stem radiculose, creeping or ascending, erect, pinnately branched; branches simple, pinnate or bipinnate; stem and branches more or less thickly covered with simple or multiform paraphyllia; stem-leaves ovate-triangular to oblong-lanceolate, acuminate, cordate, plicate, strongly costate, papillate on one or both surfaces; branch-leaves ovate, or ovate-lanceolate, acuminate. Monoicous or dioicous; perichetial bracts rather long, costate, plicate; capsule oblong-cylindrical, asymetrical, suberect, horizontal or pendulous; annulus compound; internal membrane fully one-third the length of the teeth; cilia two to four, usually well developed; operculum from short conical to long rostrate; calyptra tubular-cucullate, long; spores small.

Plants of unequal size growing in thin or thick mats on the ground, stones, rocks, rotten wood and on the base of trees.

Synopsis of the Species.

Plants ascending-erect,
Leaves rigid, cells quadrate-oblong; branch-leaves appressed when dry. 7. *abietinum.*
Leaves soft, cells oblong-linear; branch-leaves crispate when dry. 10. *Blandowii.*
Plants creeping-ascending,
Small; paraphyllia simple; branch-leaves appressed-incurved when dry,
Branches papillate, capillary. 1. *pygmaeum.*
Branches not papillate. 2. *minutulum.*
Large; paraphyllia multiform; branch-leaves appressed when dry,
Stem-leaves spreading-recurved, margins plane; perichetium not ciliate. 4. *recognitum.*
Stem-leaves erect-spreading, margins recurved,
Perichetium not ciliate; annulus narrow, indistinct. 5. *Philiberti.*
Perichetium ciliate; annulus compound, distinct. 6. *delicatulum.*
Medium sized; paraphyllia mostly linear-geniculate.
Leaf-cells with several minute papillae. 3. *scitum.*
Leaf-cells with one, rarely two papillae.
Leaves smooth or lightly papillate. 11. *paludosum.*
Leaves strongly papillate on both surfaces.
Branch-leaves roundish-ovate, short-acuminate. 8. *Virginianum.*
Branch-leaves ovate-lanceolate, long-acuminate. 9. *microphyllum.*

EUTHUIDIUM: Stem-leaves and branch-leaves heteromorphous, papillate on both surfaces; leaf-cells quadrate-hexagonal to oblong-rhomboidal; paraphyllia simple or multiform.

1. THUIDIUM PYGMAEUM Br. & Sch.

Thuidium pygmacum Br. and Sch. Bryol. Eu. fasc. 49–51: 6. 1852.

Hypnum pygmaeum Sull. Mosses U. S. 67. 1856.

Plants *very small*, dirty green in felt-like mats; stem 1 to 2 cm. long, creeping, pinnately branched; branches pinnate, capillary, subcompressed, *papillate;* paraphyllia *simple*, short, 2 to 5 cells long; stem-leaves triangular-ovate, narrowly acuminate, distant; leaf-cells quadrate-hexagonal (.006 mm.) pluripapillate; branch leaves (.15 mm) ovate, obtuse, *appressed-incurved* when dry. Monoicous; perichetial bracts erect, lanceolate or oblong-lanceolate, entire or serrulate above; pedicel long, flexuous; capsule oblong, *inequilatcral*, inclined or horizontal, wide-mouthed; annulus broad, compound; cilia 2 to 3; operculum broadly conical, obliquely rostrate; spores .007 to .009 mm.

On stones, rarely on the ground, in calciferous districts. New Jersey (Austin); Pennsylvania (James, Porter, Rau); Ohio (Sullivant); Canada (Macoun).

Type locality American; collected by W. S. Sullivant, at Columbus, Ohio. Type at Kew. in Herb. Schimper.

ILLUST. Sulliv. Icon. Musc. 153. *pl. 98.* 1864.

EXSIC. S. & L. Musc. Bor. Am. Ed. 1, no. 275; Ed. 2, no. 408. Aust. Musc. App. no. 296.

2. THUIDIUM MINUTULUM (Hedw.) Br. & Sch.

Thuidium minutulum Br. & Sch. Bryol. Eu. fasc. 49–51. 1852.

Hypnum minutulum Hedw. Musc. frond. 4: 99. 1791.

Plants small, dark green, in thin mats: stem 2 to 4 cm. long, creeping, pinnately branched; branches simple or pinnate, spreading, subcompressed; paraphyllia *simple*, 3 to 6 cells long; stem leaves ovate-triangular, acuminate, recurved or revolute below, margins papillate-crenulate, costa vanishing in the abrupt usually curved acumen; leaf-cells quadrate-hexagonal (.009 mm.) pluripapillate, *marginal larger*; branch-leaves ovate-acuminate, *subcrispate* and *appressed incurved* when dry. Monoicous; perichetial bracts erect, long and narrowly acuminate, entire; pedicel long, flexuose; capsule *oval-oblong* to obovoid-oblong, asymetrical, horizontal, *rough;* annulus compound, deciduous; operculum conical, slenderly beaked, usually oblique, as long as the capsule; spores .007 to .010 mm., almost smooth., maturing in autumn.

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* Apical cell of ultimate branch leaves crowned with two or more papillae.

On rotton wood, not rarely on the ground and on stones in the Southern States. From New Brunswick to Minnesota and from Canada to Florida.

Type locality, Lancaster, Pennsylvania, Muhlenberg.

ILLUST. Hedw. Musc. frond. *pl. 34.* 1791. Br. & Sch. Bryol. Eu. 5. *pl. 481.* 1852. Husnot, Musc. Gall. *pl. 87.* 1894.

EXSIC. Drumm. Musc. Am. ed. 2. No. 137. Sull. Musci All. No. 4. Sull. & Lesq. Musc. Bor. Am. ed 2. no. 481. Aust. Musc. App. No. 297. Macoun, Can. Musc. no. 268.

Rem. Distinguished from the closely related *Th. pygmaeum* by its larger size, dark green color, stem-leaves with longer costa and branch-leaves subcrispate when dry.

3. THUIDIUM SCITUM (Beauv.) Aust.

3. *Hypnum scitum* Beauv. Prodr. 69. 1805.
Hypnum Stereodon scitus Brid. Bryol. Univ. 2: 575. 1827.
Thuidium scitum Aust. Musci App. 51. 1870.
Rauia scita Aust. Bull. Torr. Club, 7: 16. 1880.

Medium sized plants, glaucous-green to yellow-brown, in appressed mats. Stem 4–6 cm. long, prostrate, simple or divided, *densely pinnately* branched; branches simple, spreading, *terete* when dry; paraphyllia multiform, mostly linear; stem-leaves broadly triangular, *subauriculate-cordate*, the pellucid costa vanishing at the base of the long narrow curved acumen, bisulcate; leaf-cells roundish hexagonal (.006 mm.) middle basal oblong, pluripapillate (3–6); branch-leaves broadly ovate-acuminate. Monoicous; perichetial bracts erect, long filiform-acuminate; capsule oblong-cylindrical, *straight* or slightly curved; *erect* or inclined; annulus of three rows of large pellucid cells; teeth linear-lanceolate, *pale;* cilia 2–3, rarely perfect; operculum conical-rostrate; spores rough .009–.011 mm. Maturing in the autumn and winter.

On the roots, at base of trees, more commonly the beech, rarely on stones, or on the ground. Canada (Macoun); Ohio (Miss Biddlecome); New Jersey (Austin); Wisconsin (Gillman); District of Columbia (Holzinger.)

Type locality, North American. Type in Delessert Herbarium, Geneva, Switzerland.

ILLUST. Sull. Icon. Musc. 155. *pl. 99.* 1864.

EXSIC. Sull. Musc. All. no. 6. S. & L. Musc. bor. Am. ed. 2. no. 409. Aust. Musc. App. no. 300. Macoun, Can. Musc. no. 269.

3a. THUIDIUM SCITUM ÆSTIVALE Austin, Musci App. 51. 1870.

Thuidium aestivum Aust. Bull. Torr. Club, 5, 23. 1874.

Thuidium scitum var. *aestivale* Aust. Musc. App. no. 301. 1870.

Hynum scitum var *aestivale* Lesq. & Jas. Mosses, of N. A. 323. 1884.

Stem more diffusely divided, less densely pinnate; perichetial bracts more abruptly filiform-acuminate; capsule *oblong-cylindrical. horizontal*, wide-mouthed; cilia well-developed; teeth lanceolate, yellowish below; operculum more abruptly and shorter beaked; spores larger.

Canada (Macoun); Ohio (Miss Biddlecome); New York (Howe, Peck); New Jersey (Austin); North Carolina (Small & Heller); Pennsylvania (Porter, Rau); Wisconsin (Cheney & True); Vermont (Grout.)

EXSIC. Aust. Musc. App. no. 301.

Rem. An evolute, as *Th. scitum* is the involute form of the same specific type. Both are neat, pretty mosses with finely granular leaves and very small papillae.

4. THUIDIUM RECOGNITUM (Hedw.) Lindb.

Hypnum recognitum Hedw. Musc. frond. 4: 92. 1791.

Hypnum protensum Michx. Fl. Bor. Am. 2: 317. 1803.

Hypnum tamariscinum var. *recognitum* Brid. Bryol. Univ. 2: 440. 1827.

Thuidium delicatulum Br. & Sch. Bryol. Eu. Fasc. 49-51. 1852.

Thuidium recognitum Lindb. Not Sallsk. pro Fauna et Flora Fenn. Forh. 13: 416. 1874. Schimp. Syn. Musc. ed. 2, 614. 1876.

Rather large plants in intricate mats, dark green to yellow-brown; stem 5 to 19 cm. long, creeping or ascending, pinnately branched; branches pinnate, spreading; paraphyllia multiform; stem leaves *spreading-recurved*, broadly triangular, abruptly acuminate, *subauriculate-cordate*, the papillate-serrate margins usually *plane*, sometimes recurved; the curved acumen *thickened* by the *percurrent* costa; leaf-cells unipapillate, not rarely bipapillate (papillae large), oblong-quadrate at the basal margins, oblong-rhomboidal above, broadly linear along the costa; branch-leaves much smaller, ovate-acuminate. Dioicous; perichetial bracts rigid, the narrow acumen about as long as the body, serrate or with a few jagged teeth; capsule narrowly cylindrical, curved, horizontal; annulus broad, compound, operculum long conical to conic-rostrate; cilia 3 or 4; spores .011 to .013 mm.

On the ground, rotten wood and on rocks in damp shady places. From the Labrador (Waghorne) to British Columbia (Macoun) southward. Rare or absent on the Pacific slope and in the Gulf States.

Type locality in Saxony, Germany. Type in the Boissier Herbarium, at Geneva, Switzerland!

ILLUST. Hedw. Musc. frond. *pl. 35.* 1791. Husnot, Musc. Gall. *pl. 88.* 1894. Lindberg, l. c. 416. *pl. 1. fig. 9.* 1874.

EXSIC. Drummond, Musci. Am. no. 214. S. & L. Musc. Bor. Am. ed. 2, no. 404; Aust. Musc. App. no. 303; Macoun, Can. Musc. no. 271.

Rem. Easily distinguished from *T. delicatulum* by its spreading-recurved leaves with their *long-celled thickened* acumen and the *absence* of cilia on the perichetial bracts. In some European specimens the perichetial bracts are longer than those of American plants.

5. THUIDIUM PHILIBERTI Limpr.

Thuidium intermedium Philib. Rev. Bryol. **20**: 33. 1893. Not Mitt. 1851.

Thuidium Philiberti Limpr. Rab. Kryptfl. 4: 2, 835. 1895.

Medium sized plants, yellow to dark green, in intricate mats; stem 4 to 8 cm. long, creeping, pinnately branched; branches pinnate or bipinnate; paraphyllia multiform; stem-leaves triangular-cordate-acuminate, usually with a *hyaline filiform* point, margins revolute or recurved, at least below; leaf-cells oblong-quadrate to oblong-rhomboidal. Dioicous; perichetial bracts loose, *flexuous spreading* or reflexed, serrate, rarely with a few short cilia on the innermost, acumen about *three* times as long as the short, scarcely costate body; capsule oblong-cylindrical, curved, horizontal; annulus *narrow, indistinct,* tardily or imperfectly deciduous; operculum conic-rostate, curved; spores .012 to .016 mm., almost smooth, maturing in October. (Plate 260.)

In wet, swampy places on the ground or the base of small trees. New Jersey (Best); Pennsylvania (Porter).

Type locality, European (France)!

Rem. Probably an involute form of the preceding, from which it differs by its pointed leaves, indistinct annulus, looser perichetial bracts, which are usually destitute of cilia, and more uniform leaf cells.

6. THUIDIUM DELICATULUM (L.) Mitt.

Hypnum delicatulum L. Sp. Pl. 1125. 1753.

Hypnum delicatulum Hedw. Musc. frond. 4: 95. 1791.

Thuidium delicatulum Mitt. Journ. Linn. Soc. 12: 578. 1869.

Plants large, in intricate spreading mats, yellow-green ; stems 5 to 10 cm. long. creeping-ascending, pinnately branched; branches pinnate or *bipinnate;* paraphyllia numerous, multiform ; stem leaves *appressed* when dry, erect-spreading when moist, triangular-cordate, rather *gradually* acuminate, costa *vanishing in the acumen*, the papillate-serrate margins recurved; leaf-cells unipapillate or bipapillate, oblong-quadrate to elliptical-rhomboidal; branch-leaves ovate or ovate-acuminate. Dioicous; perichetial bracts rather loose, inner more or less *ciliate*, the loricate-filiform serrate acumen about twice as long as the blade; capsule cylindrical, strongly curved, horizontal; annulus compound, tardily deciduous ; operculum conic-rostrate, beak curved; cilia 3 to 4; spores rough, .014 to .018 mm, maturing in winter.

On the ground, rotten wood, stones and rocks in shady places. From Labrador (Waghorne) to British Columbia (Macoun) southward through the United States; rare or absent in the Pacific States. Also in the West Indies and Central and South America.

Type localities, " Pennsylvania, Maryland and Virginia."

ILLUST. Dill. Hist. Musc. 546. *pl. 83. fig. 6.* 1741. Hedw. Musc. frond. 4: *pl. 33.* 1791. Lindberg, l. c. *pl. 1. fig. 8.* 1874. Husnot, Musc. Gall. *pl. 89.* 1894.

EXSIC. Drumm. Musc. Bor. Am. no. 213; 2d ed. no. 136. Sull. Musc. All. no. 3. as *H. tamariscinum* Hedw. S. & L. Musc. Bor. Am. ed. 1, no. 272; ed. 2, no. 403. Aust. Musc. App. 302. Macoun, Can. Musc. no. 272.

Rem. This and the preceding species often grow together. In American herbaria they are confused. *Th. delicatulum* is frequently named *Th. recognitum* and vice versa. The names *Hypnum tamariscinum* and *Hypnum proliferum* have been used indiscriminately for either.

7. THUIDIUM ABIETINUM (L.) Br. & Sch.

Hypnum abietinum L. Sp. Pl. ed. 2, 1591. 1763.

Hynum Stereodon abietinus Brid. Bryol. Univ. 2: 573. 1827.

Thuidium abietinum Br. & Sch. Bryol. Eu. fasc. 49–51. 1852.

Plants rather large, densely caespitose, yellow-green above, darker below; stem 5 to 9 cm. long, ascending-erect, rigid, simple or divided, *closely pinnately* branched; branches simple, unequal, attenuate, spreading or recurved, terete when dry; paraphyllia multiform, mostly linear; stem-leaves broadly ovate, acuminate, deeply biplicate, margins papillate-serrulate, plane or recurved, costate to the base of the acumen, appressed when dry; leafcells *in rows*, unipapillate, roundish, quadrate-hexagonal and very small at basal margins, oval-rhombic and much larger above; branch-leaves similar but smaller, apical cell with usually two papillae, sometimes only one. Dioicous; perichetial bracts mostly entire; capsule narrowly cylindrical, suberect, curved, strumose; annulus compound; segments widely open, papillate-striate; cilia 1 to 3, usually imperfect; operculum long-conical, acute; spores papillose, .012 to .016 mm., maturing in spring.

On rocks, stones and the ground, in dry sterile places. Common in Europe and North America, from Greenland to Virginia (E. G. Britton), and from Newfoundland (Waghorne) to British Columbia (Macoun.). Fruiting in Colorado (T. C. Porter) and in Montana (F. W. Anderson). Rare or absent in the Gulf States and on the Pacific slope.

Type locality European.

ILLUST. Hedw. Musc. frond. 4: *pl. 32.* 1791. Br. & Sch. Bryol. Eu. 5. *pl. 485.* 1852. Husnot, Musc. Gall. *pl. 88.* 1894.

EXSIC. Drumm. Musc. Bor. Am. no. 216. Aust. Musc. App. no. 304. Macoun, Can. Musc. no. 273.

8. THUIDIUM VIRGINIANUM (Brid.) Lindb.

Hypnum Stereodon Virginianus Brid. Bryol. Univ. 2: 276. 1827.

Thuidium Virginianus Lindb. Musc. Scand. 36. 1868. Besch. Prodr. Bryol. Mex. 91. 1871.

Hypnum gracile Lancastriense L. & J. Mosses N. A. 324. 1884.

Thuidium punctulatum De Not. Erbar. Critt. Ital. no. 909. 1863. et. Epil. 234. 1869. Limpr. Rab. Kryptfl. 4: 3, 825. 1895.

Plants small, dark or dirty green, intricately caespitose; stem 2–4 cm. long, creeping, pinnately branched; branches simple, erect-spreading; paraphyllia multiform; stem leaves *roundish*, ovate-triangular, costa vanishing in the short acumen, scarcly plicate, margin *plane*, erose-dentate below, serrate above; leaf-cells oblong-quadrate to hexagonal (.009 mm.) unipapillate; papillae *stout*, broad at base, rarely bifurcate; branch leaves *roundish, ovate-acuminate*, acumen *short, broad, sharply serrate*. Monoicous; perichetial bracts erect, rigid, deeply plicate, margins denticulate-serrate; pedicel long, purplish; capsule oblong-cylindrical, inclined or horizontal, curved; annulus compound; cilia 2–3, nodose or appendiculate; operculum conical, obtusely short-beaked; spores smooth .008–.012 mm; maturing in spring. (Plate 261.)

In open woods on the ground, about stumps and roots of trees; from Massachusetts to Wisconsin south to Mexico. New York (Howe, Pease); New Jersey (Austin, Best); North Carolina (Small and Heller); Pennsylvania (James, Porter, Rau); Massachusetts (Faxon); Virginia (E. G. Britton, Small); Wisconsin (True).

Type locality, Virginia, Bannister and Mitchell.

ILLUST. Dill. Hist. Musc. 282. *pl. 36. f. 18.* 1741.

EXSIC. S. & L. Musc. Bor. Am. ed. 1, no. 278; ed. 2, no. 411. Aust. Musc. App. no. 299.

9. THUIDIUM MICROPHYLLUM (Sw.).

Hypnum microphyllum Sw. Prod. 142. 1788. Muhl. Cat. 99. 1813.

Hypnum gracile Br. & Sch. Lond. Journ. Bot. 2: 668, name only. 1843. Mueller, Syn. Musc. 2: 488. 1851.

Hypnum calyptratum Sull. Pac. R. Rep. 4: 190. *pl. 10.* 1856.

Thuidium gracile Br. & Sch. Bryol. Eu. fasc. 49-51. 1852. Schimper Syn. Musc. ed. 2, 611. 1876.

Thuidium pallens Lindb. Ms. 1864.

Plants of medium size, flavescent to pale green, in spreading mats; stem 3 to 5 cm. long, creeping, pinnately branched; branches simple, spreading, subcompressed; paraphyllia multiform; stem leaves broadly ovate to ovate-lanceolate, long and narrowly acuminate, biplicate, margins sinuate-serrulate, rarely entire, plane or revolute, costa subpercurrent; leaf-cells oblong-quadrate to short-rhomboidal, usually *echlorophyllose*, *unipapillate*; papillae blunt; branch-leaves ovate-lanceolate, acuminate, the narrowly *oval* apical cell unipapillate. Monoicous, perichetial bracts erect, serrulate or entire; pedicel flexuous-curved; capsule oblong or oblong-cylindrical, horizontal, curved; annulus compound; cilia 2 to 4; operculum *mammilate* to *short conical*, acute or obtuse; spores, .008–.012 mm., rough, maturing in summer.

On rotton wood, base of trees, stones and the ground. Canada, Manitoba and Vancouver's Island, southward, through the United States, east of the Rocky Mountains, to New Mexico. (Bigelow.)

Type from Jamaica, Swartz, in Herb. Boissier. !

ILLUST.: Hedw. Spec. Musc. *pl. 69. figs. 1–5.* 1801. Sull. Icon. Musc. 156. *pl. 100.* 1864.

EXSIC.: Drumm. Musc. Bor. Am. no. 217; ed. 2, nos. 140-141. Sull. Musc. All. no. 5. Sull. & Lesq. Musc. Bor. Am. ed. 1, no. 277; ed. 2, no. 410. Aust. Musc. App. no. 298.

Rem. Quite variable, yet easily distinguished by its characters. Var. *Ravenellii* S. & L. is one of many involute forms growing on stones and in the sand in South Carolina and Florida.

9a. THUIDIUM MICROPHYLLUM LIGNICOLUM (Kindb.).

Thuidium lignicola Kindb. Ott. Nat. 4: 63. 1890.

Plants larger, often rufescent, leaves broader, margins more or less recurved; leaf-cells more uniformly rhombic or rhomboidal; capsules usually shorter and more turgid.

From Ohio northward to Canada and westward to Vancouver's Island, with the type and scarcely separable from it !

HETEROTHUIDIUM: Stem leaves and branch leaves similar, smooth or more strongly papillate on lower surface; leaf cells oblong-linear to narrowly rhomboidal; paraphyllia dense, filamentous.

10. THUIDIUM BLANDOWII (W. & M.) Br. & Sch.

Hypnum Blandowii Web. &. Mohr, Bot. Tasch. 332. 1807.

Hypnum abietinum var. *paludosum* Wahl. Fl. Suec. 698. 1826.

Hypnum laricinum Wils. Eng. Bot. Suppl. 2: *pl. 2760.* 1832.

Thuidium Blandowii Br. & Sch. Bryol. Eu. fasc. 49-51: 10. 1852.

Plants of *large* size, densely caespitose, yellow-green above, darker below; stem 5 to 10 cm., long, *erect*, *rigid*, simple or divided, closely pinnately branched; branches simple, spreading or recurved; paraphyllia very numerous, tomentose, from an *oblong-linear rufescent* base, long-filamentous; stem-leaves *soft*, ovate-triangular, narrowly acuminate, deeply concave, sulcate, abruptly contracted to a *subclasping* decurrent base with paraphyllose *appendages*; margins entire or sinuate-serrulate; costa vanishing above the middle; leaf-cells oblong-fusiform to linear-rhomboidal, with a *large* papilla at the *distal* end of each below, nearly smooth above; branch-leaves ovate or ovate-lanceolate acuminate, *subcrispate* when dry. Monoicous; perichetial bracts entire or denticulate; capsule oblong-cylindrical, curved, horizontal; cilia 3; segments scarcely rimose; annulus compound; operculum conical; spores smooth, .012 to .014 mm.

On wet marshy ground, with a northern range. Greenland (Fl. Gr.); Labrador (Waghorne); Canada and British Columbia (Macoun); southward to Idaho (Leiberg); Colorado (Wolf & Rothrock); Ohio (Sullivant); New York (Clinton); Vermont (Faxon).

Type locality, Megapolitania, Germany.

ILLUST. Schwaegr. Suppl. 2: 1, 158. *pl. 142.* 1824.

Br. & Sch. Bryol. Eur. 5: *pl. 486.* 1852.

Husnot, Muscol. Gall. *pl. 89.* 1894.

EXSIC. Drumm. Musc. Bor. Am. ed. 1, no. 215. S. & L. Musc. Bor. Am. ed. 2, no. 414. Aust. Musc. App. no. 305. Macoun, Can. Musc. no. 274.

Rem. Involute forms are found as far south as New Jersey and generally referred to the following species. The relation between *Th. paludosum* and *Th. Blandowii* is very close, and specimens are occasionally met with, a satisfactory reference of which is very difficult. It is probable that the former is a derivative from the latter, the difference due to a more southern habitat with a consequent tendency to spread to drier situations.

11. THUIDIUM PALUDOSUM (Sulliv.) Rau & Herv.

Hypnum paludosum Sull. Musc. All. No. 7. 1846. Mosses U. S., 68. 1856.

Elodium paludosum Austin, Musc. App. no. 306. 1870. Ren. & Cardot, Musci Am. Sept. 63. 1893.

Thuidium paludosum Rau & Herv. Cat. 38. 1880.

Plants of medium size, in spreading mats, yellow-green; stem 4 to 6 cm. long, pinnately branched; branches simple, spreading, subcompressed; paraphyllia numerous, geniculate-branching, filamentous; stem leaves rather *rigid*, *plicate-striate*, oblong-lanceolate, acuminate, the subdecurrent base usually with *1 to 3 cilia*, margins revolute below, recurved above, sinuate-serrulate, costa *subpercurrent;* leaf-cells oblong to linear-rhomboidal, *smooth* (in type) or with a small papilla at the *distal* end of each cell on under surface, sometimes above; branch-leaves ovate-lanceolate, acuminate. Monoicous; perichetial bracts rigid, erect, entire or serrulate above; pedicel long, slender, *wiry;* capsule oblong-cylindrical, curved, horizontal; cilia 3; annulus compound; operculum conic-apiculate; spores smooth, .012 to .014 mm.

On the ground in swamps and grassy fields, Eastern and Middle States.

Type from Ohio, in Col. Sullivant. Gray Herbarium!

ILLUST.: Sull. Icon. Musc. 157. *pl. 101.* 1864.

EXSIC.: Sull. Musc. All. No. 7. S. & L. Musc. Bor. Am. ed. 1, No. 281; ed. 2, no. 415. Aust. Musc. App. no. 306.

10 a. THUIDIUM PALUDOSUM ELODIOIDES (R. & C.).

Thuidium elodioides Ren. & Card. Hewd. 32: 251. 1893.

Often dark green, leaves smaller, margins not rarely serrate-dentate; leaf-cells papillate on both surfaces, papillae sometimes central.

With the type. More common from New York (E. G. Britton) westward. Indiana (Schuh).

Hypnum Notarisii Boul. (*Thuidium decipiens* De Not), not yet found in North America, but likely to be, connects *Heterothuidium* with *Cratoneuron* Sch.

Three Editions of Emory's Report, 1848.

A note "On the two editions of Emory's report, 1848" has recently been published by Mr. John H. Barnhart,* describing the principal differences in the botanical appendices of Major W. H. Emory's "Notes of a military reconnoissance, from Fort Leavenworth, in Missouri, to San Diego, in California, including part of the Arkansas, Del Norte and Gila rivers." These differences are that in Document 41, printed for the Senate, the "explanation of plates" is omitted, as well as the matter on *Zinnia grandiflora*, *Convolvulus nuttallii*, and *Altenanthera lanuginosa*, the last two being new names; that the plates in No. 41 were lithographed by C. B. Graham, Washington; those in No. 7 by E. Weber & Co., Baltimore, the name on plate vi. in the former being *Baileya multiflora*, in the latter *Baileya multiradiata*; and

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*Bull. Torr. Club. **22**: 394–5. 1895.